

## (12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
30 September 2004 (30.09.2004)

PCT

(10) International Publication Number  
**WO 2004/083645 A3**

(51) International Patent Classification<sup>7</sup>: **F16D 31/02**

(21) International Application Number:  
PCT/US2004/008638

(22) International Filing Date: 18 March 2004 (18.03.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/455,999 18 March 2003 (18.03.2003) US

(71) Applicant and

(72) Inventor: LAST, Harry, J. [US/US]; 1010 Kooahoo Place,  
Kailua, HI 96734 (US).

(74) Agent: NEWHOUSE, David, E.; 477 Ninth Ave., Suite  
112, San Mateo, CA 94402 (US).

(81) Designated States (unless otherwise indicated, for every  
kind of national protection available): AE, AG, AL, AM,  
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,  
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,  
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,

KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,  
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,  
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,  
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,  
ZW.

(84) Designated States (unless otherwise indicated, for every  
kind of regional protection available): ARIPO (BW, GH,  
GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),  
Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), Euro-  
pean (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR,  
GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK,  
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,  
ML, MR, NE, SN, TD, TG).

## Declaration under Rule 4.17:

— of inventorship (Rule 4.17(iv)) for US only

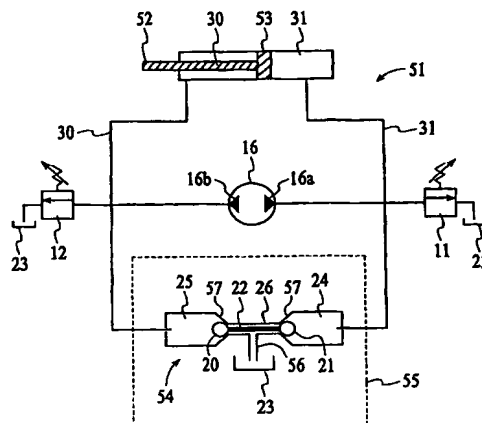
## Published:

— with international search report

(88) Date of publication of the international search report:  
27 January 2005

For two-letter codes and other abbreviations, refer to the "Guid-  
ance Notes on Codes and Abbreviations" appearing at the begin-  
ning of each regular issue of the PCT Gazette.

(54) Title: DUAL, COUPLED CHECK VALVE FOR DIRECT DRIVE, REVERSIBLE POWER SOURCES FOR HYDRAULIC SYSTEMS



(57) Abstract: An invented dual, coupled check valve mechanism is described for a direct drive, reversible hydraulic power source for hydraulic circuits that includes a manifold hydraulically coupled to the respective input/output ports and a reservoir of the hydraulic power source defining a translation passageway having mid-passage drain hydraulically coupled to the reservoir, where each end of the translation passageway has an angled annular valve seat opening to larger diameter plenum containing a check valve ball. A translating rod with a length greater and a circumferential diameter less than that of the translation passageway prevents the respective check valve balls from simultaneously seating on the valve seats at the respective ends of the translation passage way.

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/08638

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : F16D 31/02

US CL : 60/476

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 60/476, 473, 486; 4/502

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EAST: pump, motor, reversible, relief, valve, pool cover

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2,657,533 A (SCHANZLIN et al) 03 November 1953 (03.11.1953), See figure 1	1-3
A, E	US 6,751,953 B2 (MENTINK et al) 22 June 2004 (22.06.2004), See figure 3	1, 2
A	US 6,470,678 B1 (HUBER) 29 October 2002 (29.10.2002), See figure 1	1, 2
A	US 4,565,334 A (RUHL) 21 January 1986 (21.01.1986), See figure 1	1, 4

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

31 August 2004 (31.08.2004)

Date of mailing of the international search report

02 NOV 2004

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US

Commissioner for Patents

P.O. Box 1450

Alexandria, Virginia 22313-1450

Facsimile No. (703) 305-3230

Authorized officer

Thomas E. Lazo

Telephone No. 703-308-0975

*Sheila H. Venev*  
Paralegal Specialist  
Tech. Center 3700